Cold Fusion Research

The Quest for Excess

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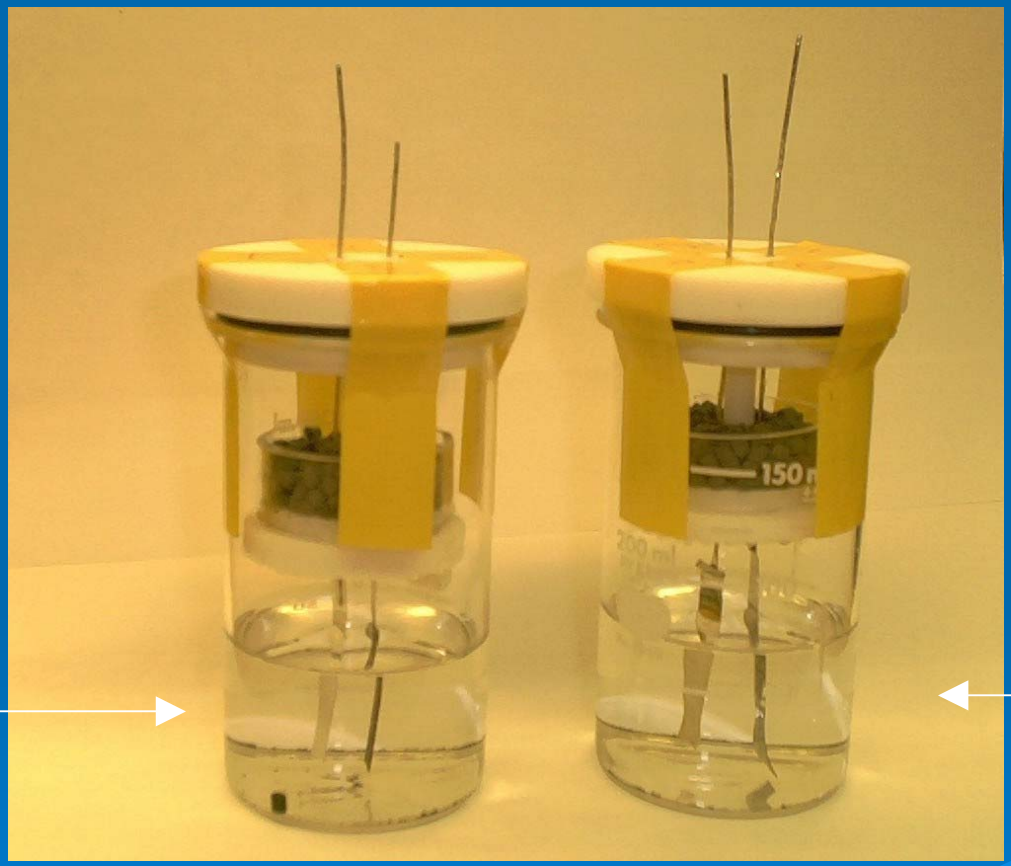
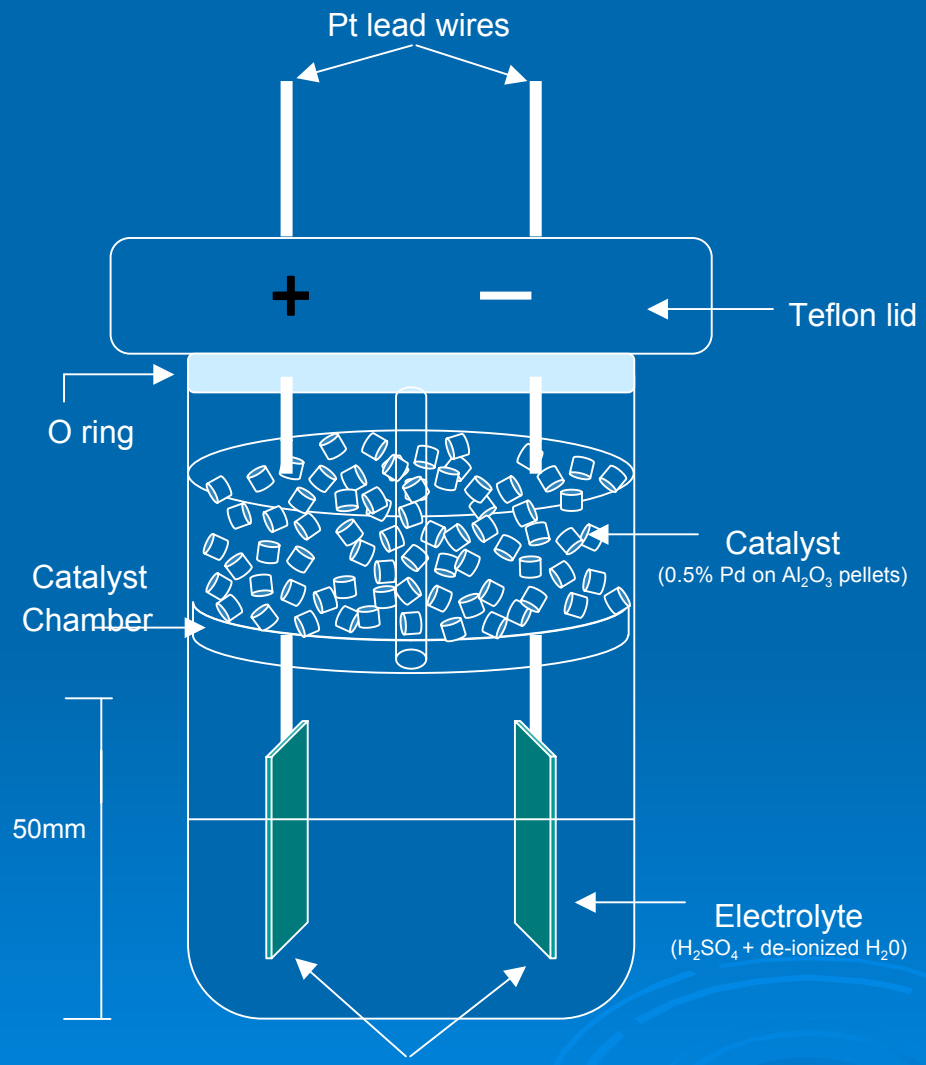
Our Cells…



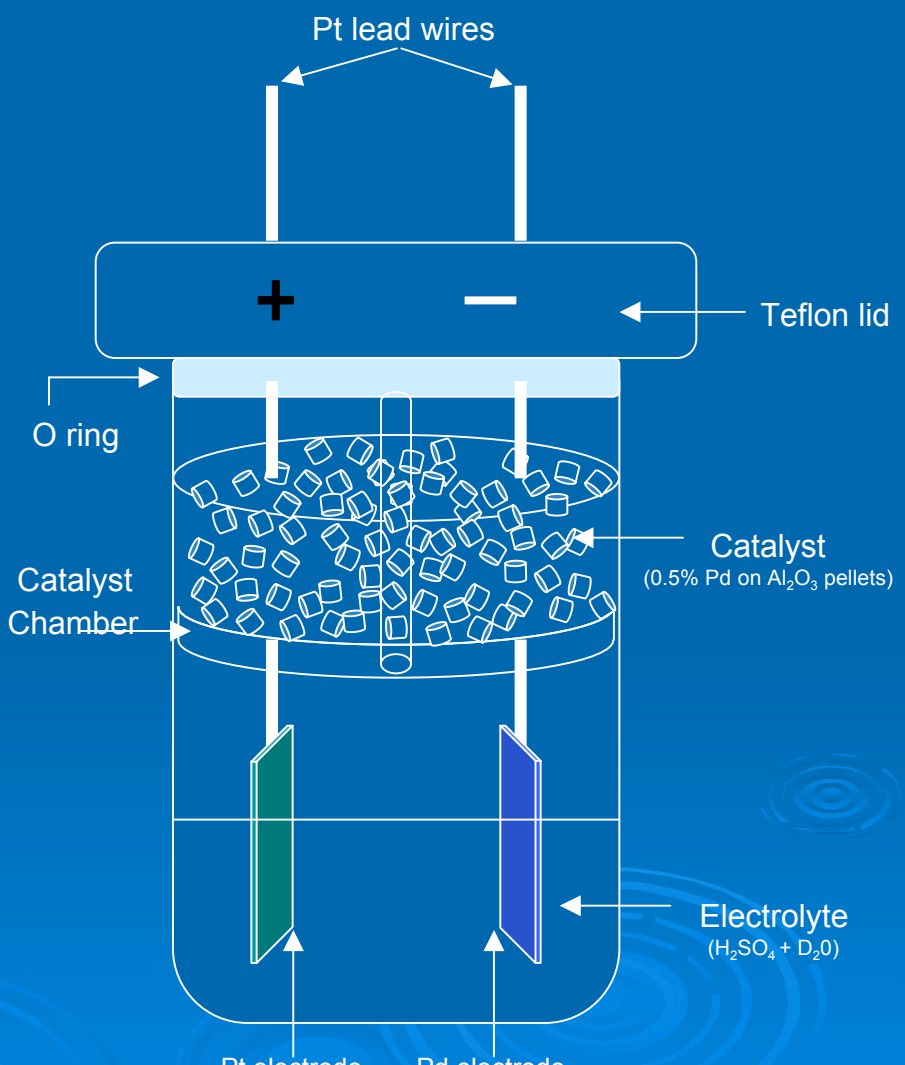
"C" Cell

"S" Cell

Cell Diagrams

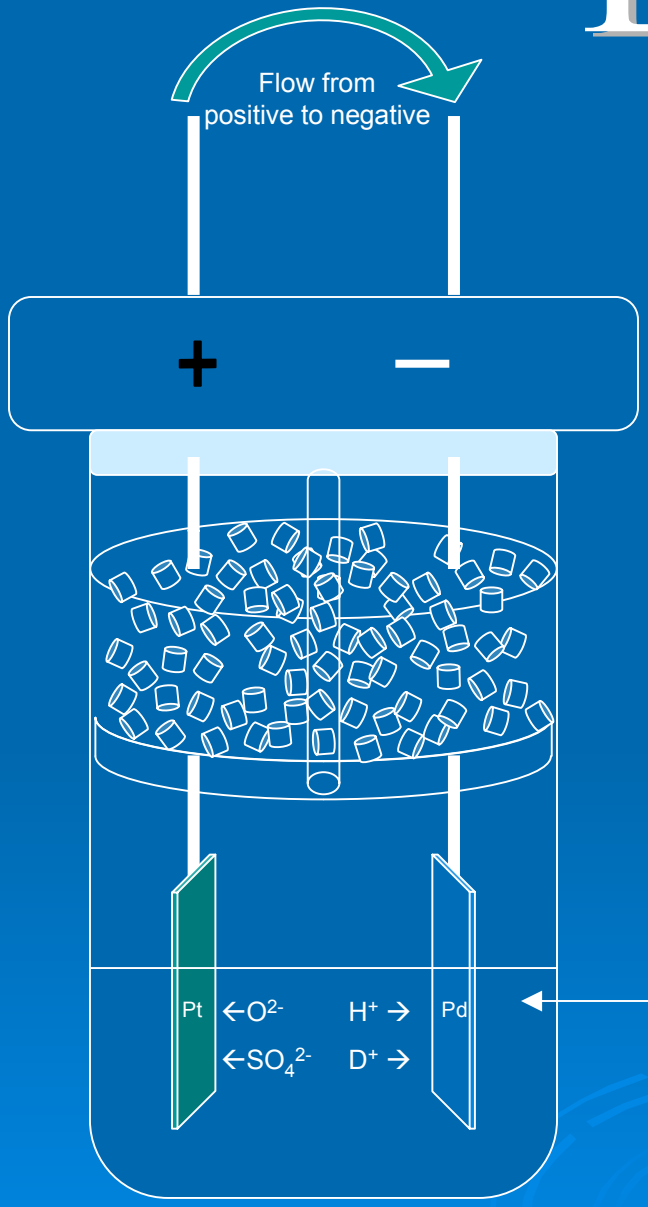


Control Cell



Experimental Cell

Electrolysis



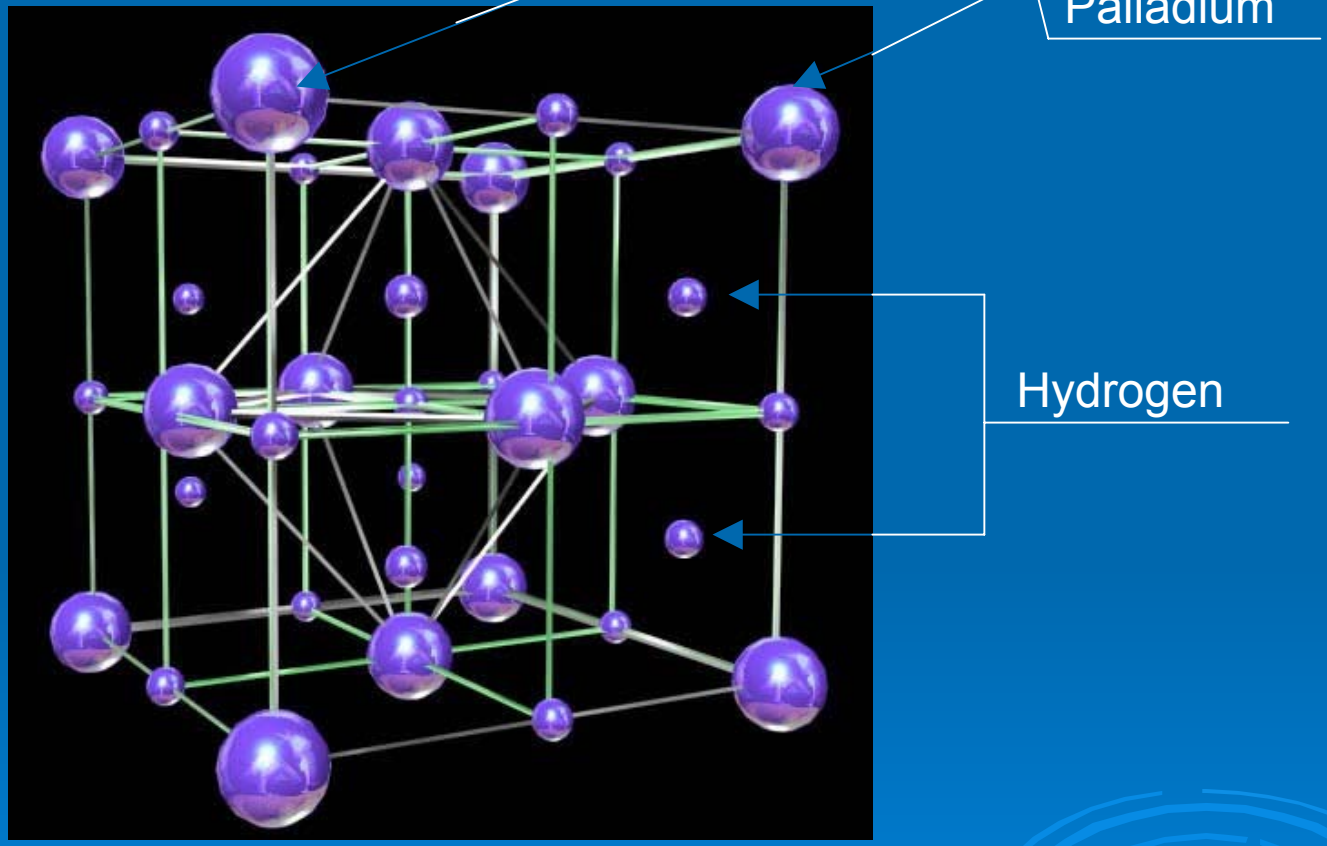
- H_2SO_4 is mixed with H_20, and H_20 is ionized
- Electric current flows through and splits water
- Oxygen goes to Platinum anode
- Hydrogen goes to Palladium cathode
- Some hydrogen is absorbed into Palladium's face center cubic structure, called interstitial solid solution
- Rest of hydrogen turns into gas and rises
- Oxygen turns into gas and rises
- O_2 and H_2 rise to catalyst (0.5% Pd on Alumina pellets) and recombines to form H_20.

<u>Electrolyte contains:</u>

Hydrogen ions
Deuterium ions
} goes to cathode (right)

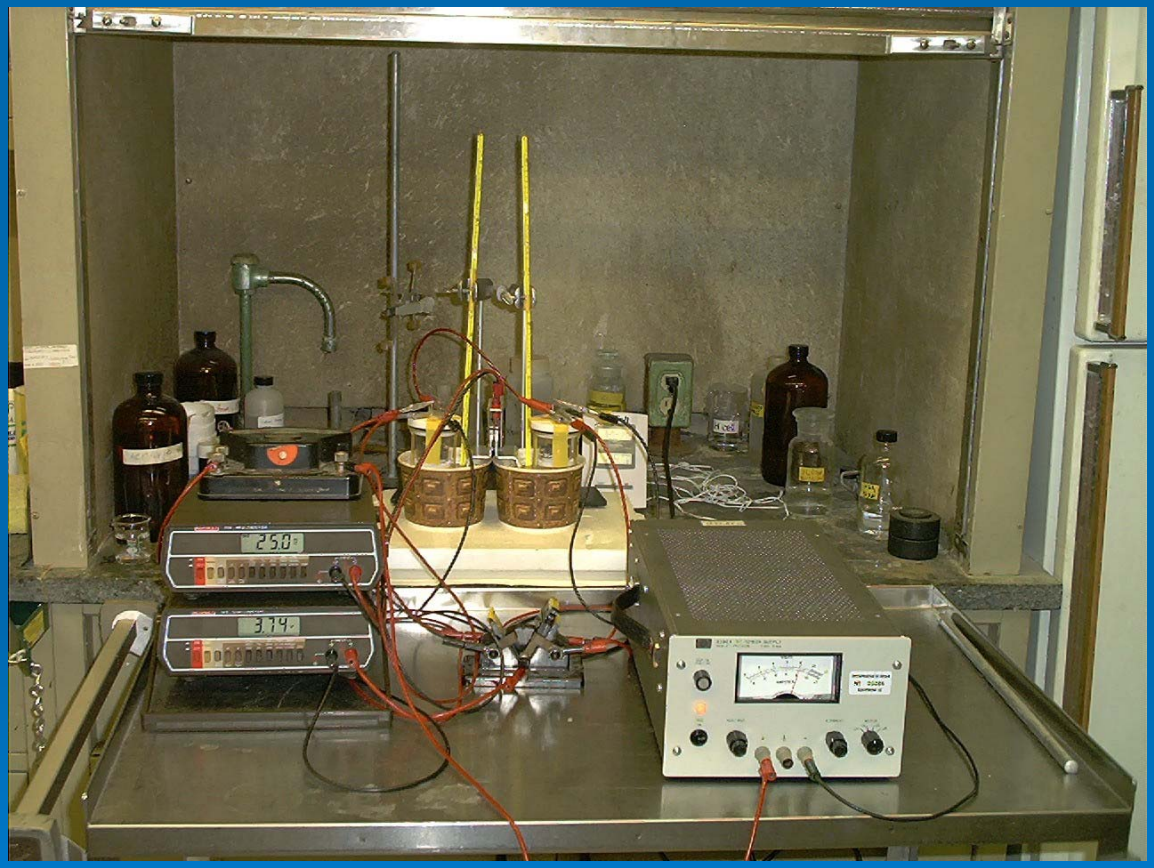
Oxygen ions
Sulfate ions
} goes to anode (left)

How does palladium absorb hydrogen?



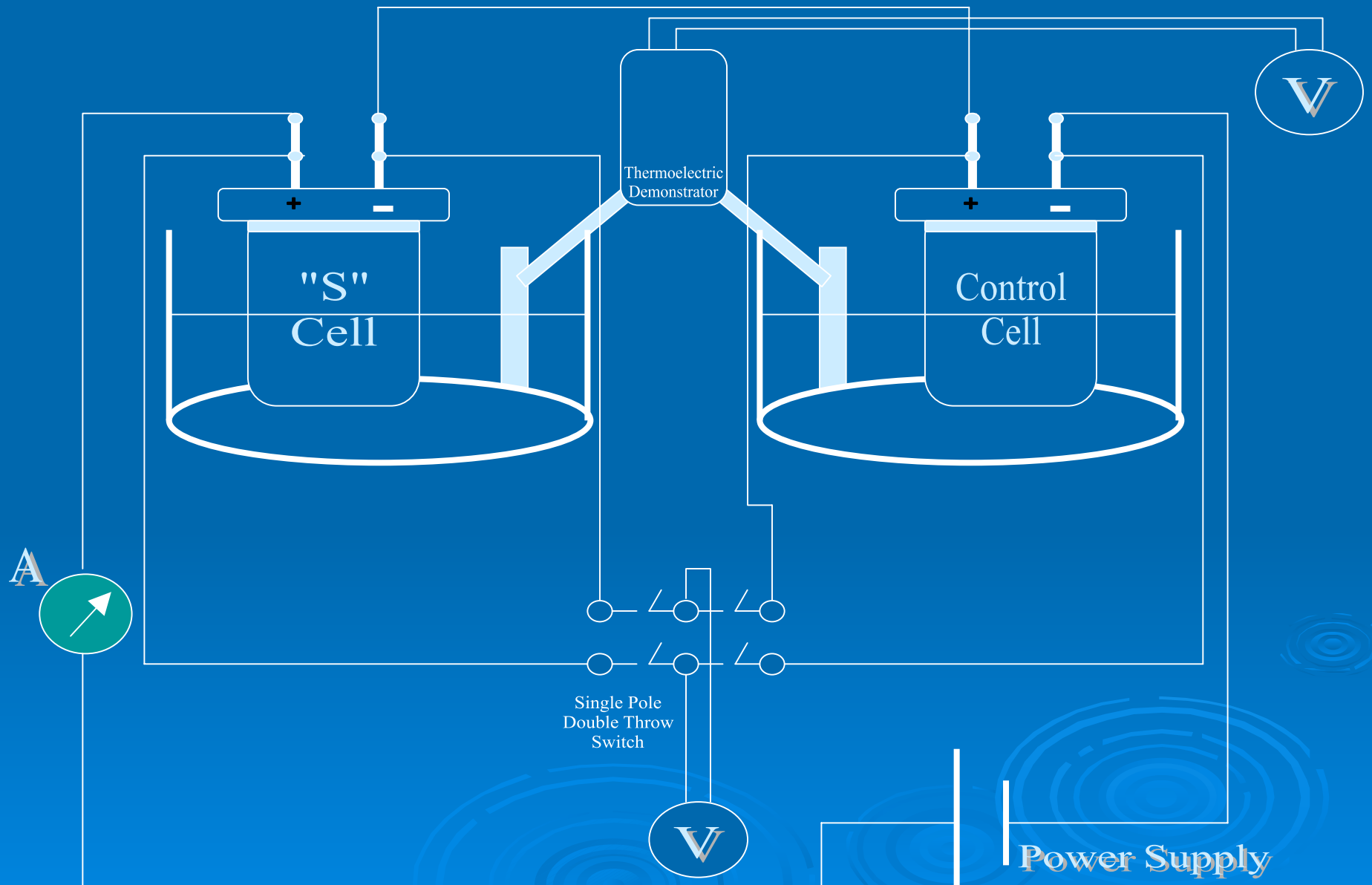
- Palladium's face center cubic structure allows hydrogen's to be absorbed into spaces in its crystal lattice.

The Setup

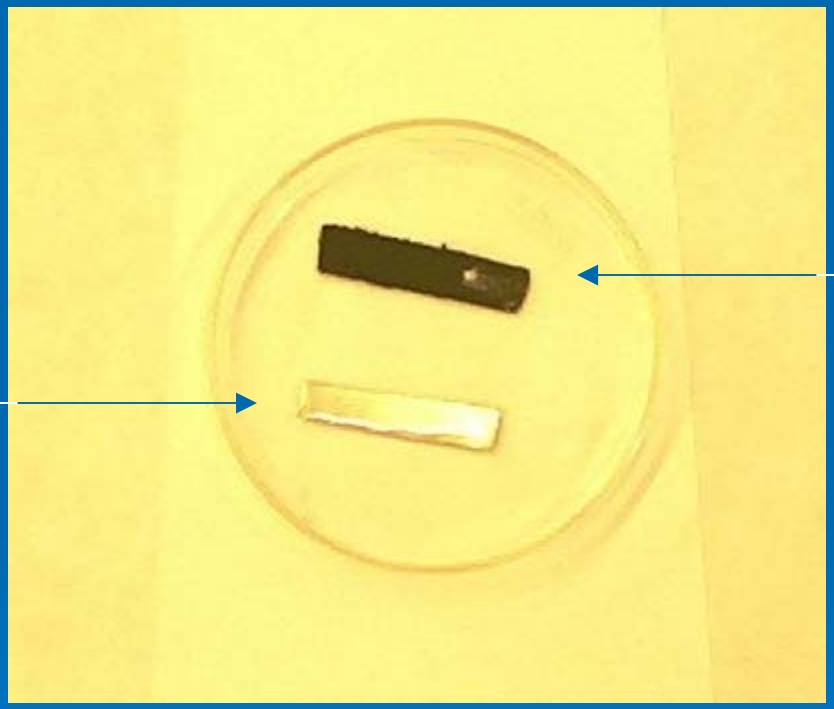


- The final setup
- Many changes made throughout summer:
- Changes in methods of temperature readings
- Current
- Power supplies

Circut Diagram



Polarity Reversal

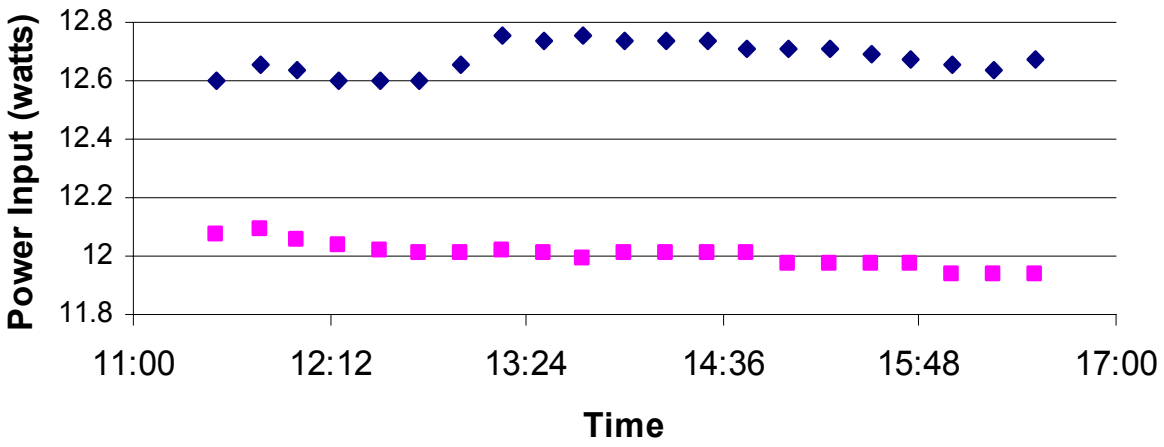


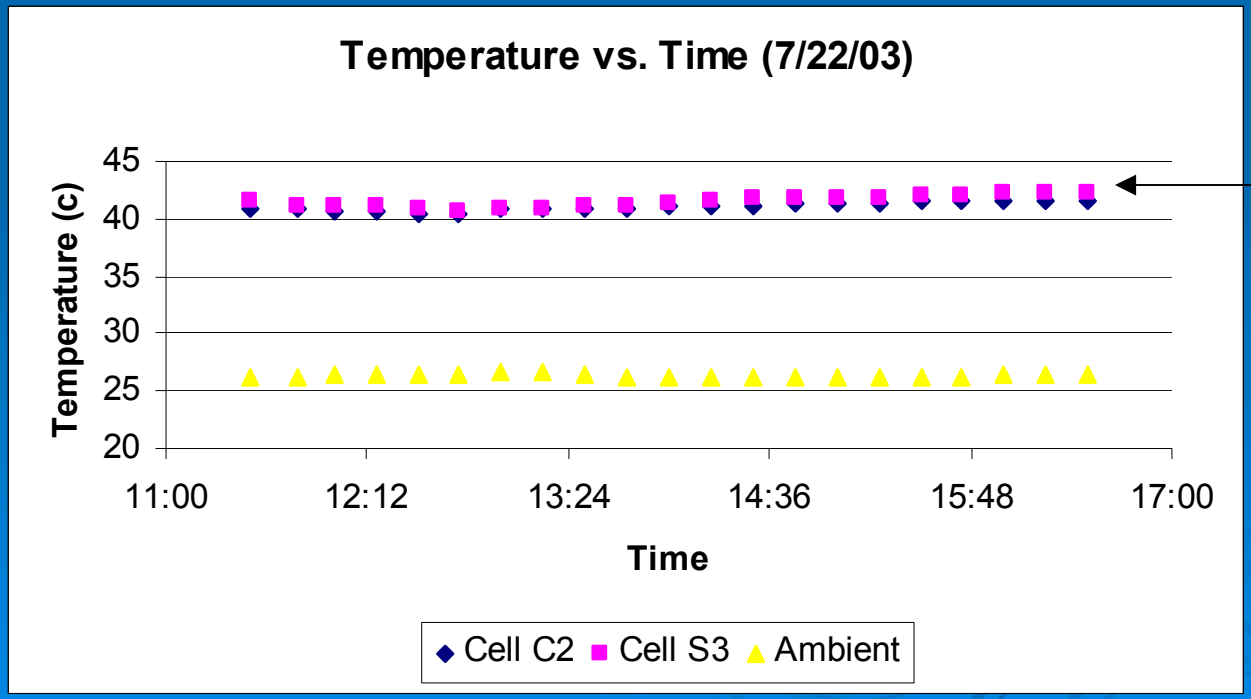
➢Pd before electrolysis

➢Pd after electrolysis and polarity reversal. The cathode has grown a “beard”

Data

- There is more power going into the C cell…





- but the S cell is has an equal or higher temperature.

Excess Heat

$$\frac{dH_e}{dt} = 223.699 * \frac{\Delta W_e}{Time_{(min)}}$$

$$\frac{dH_c}{dt} = 207.477 * \frac{\Delta W_c}{Time_{(min)}}$$

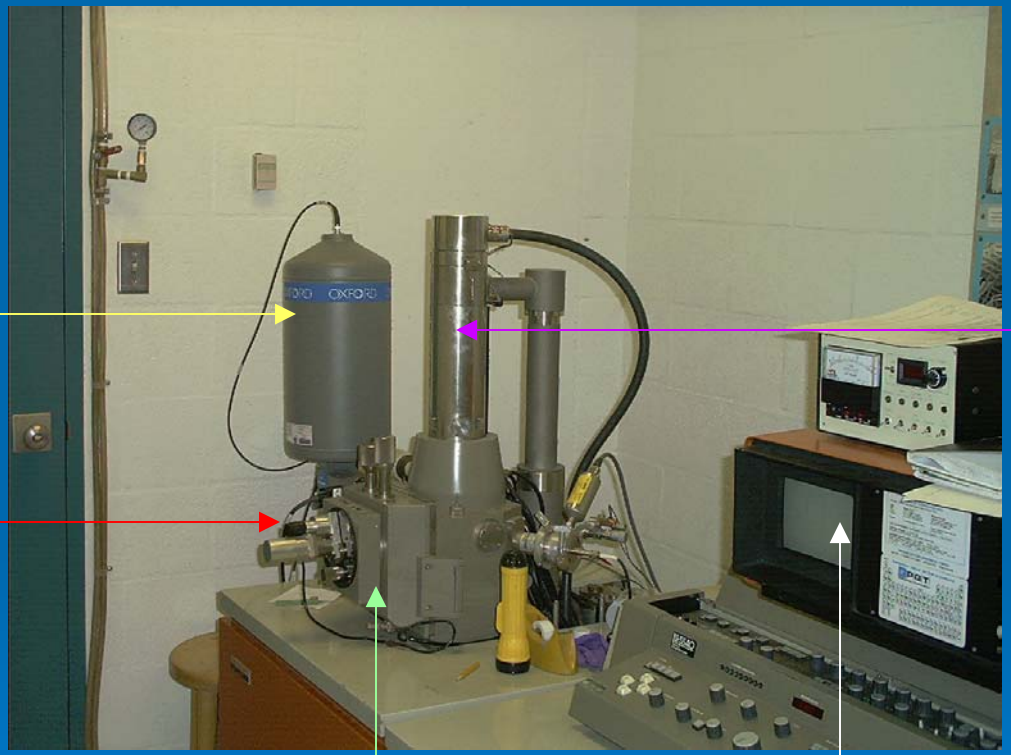
$$\left(\frac{dH_e}{dt}\right)_{(excess)} = \frac{\Delta T_e}{\Delta T_c}\left(V_c * I - \frac{dH_c}{dt}\right) + \left(\frac{dH_e}{dt} - V_e * I\right)$$

dH_c = watts lost from mass in control cell
dH_e = watts lost from mass in experimental cell
ΔW = change in mass
ΔT = change in temperature
V * I = power input

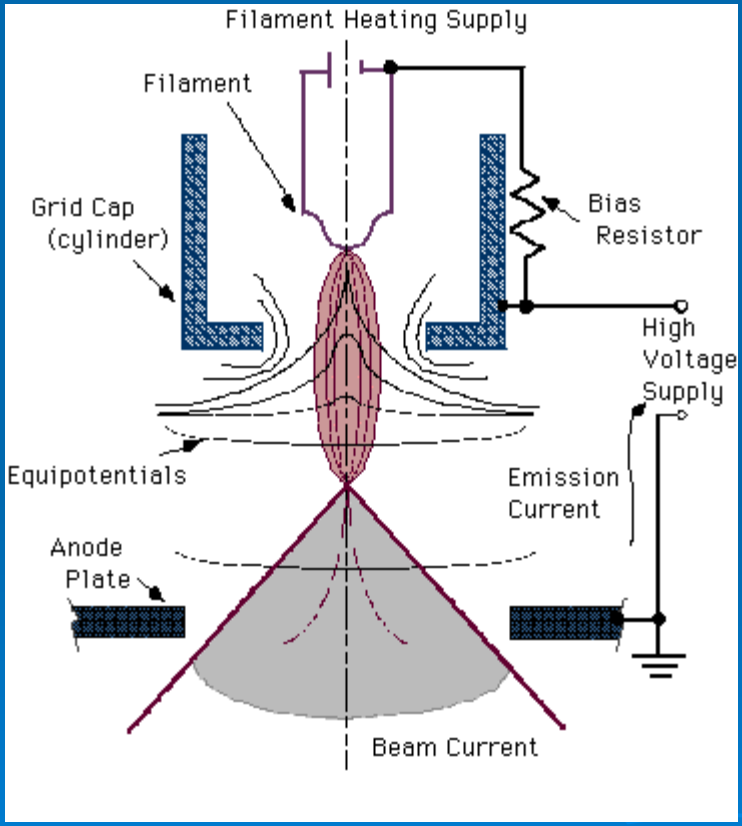
The Scanning Electron Microscope (SEM)

- Excess heat and transmutation are both evidence of Cold Fusion
- The SEM is used to search for evidence of transmutation.
- Using two programs, X-Ray Analysis and AutoImaging, we can detect just how much and exactly where transmutation has occurred.

What Keeps it Ticking?



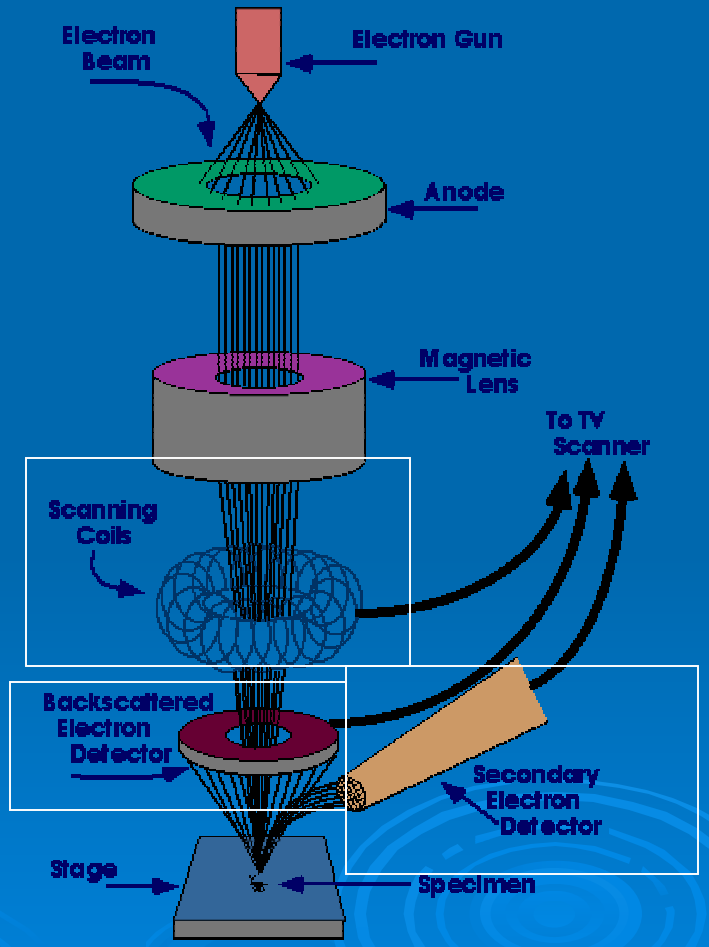
How Does it Work?



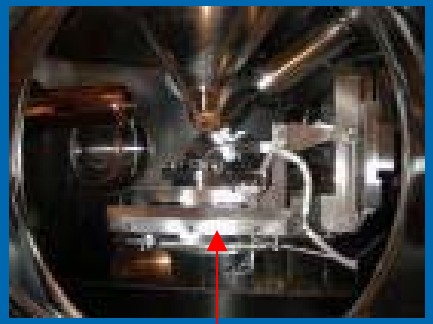
- Uses high energy electron beam to detail the sample.
- The electron beam comes from a filament.
- Voltage is applied to the filament and the corresponding anode helps create a powerful attractive force for the electrons.
- This causes the electrons to accelerate down towards the anode.
- Some however, go right by the anode and down into the sample to read and classify it.

Where does the Image come from?

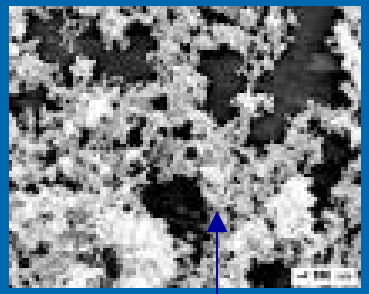
- Near the bottom, a set of scanning coils moves the focused beam back and forth across the specimen, row by row.
- As the electron beam hits each spot on the sample, secondary electrons are knocked loose from its surface. A detector counts these electrons and sends the signals to an amplifier.
- The final image is built up from the number of electrons emitted from each spot on the sample.



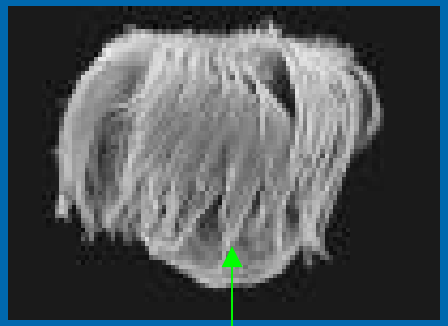
What can we gain from these Images?



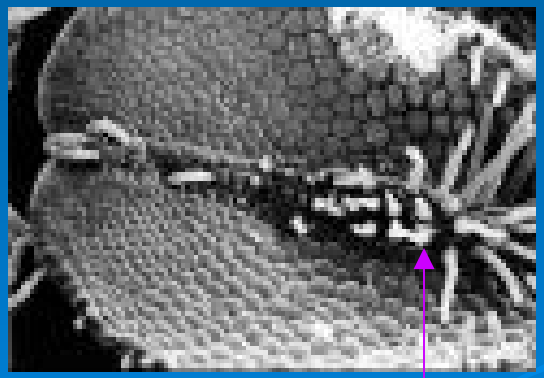
Inside of the SEM's sample chamber



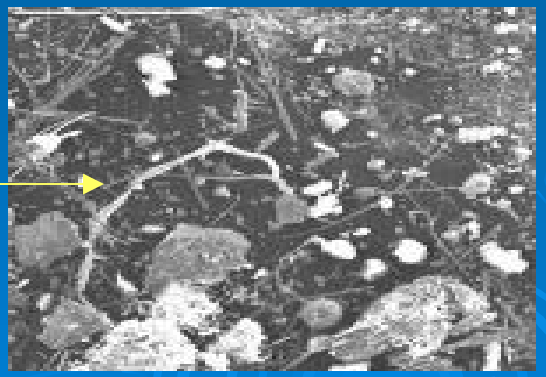
Unknown metal samples



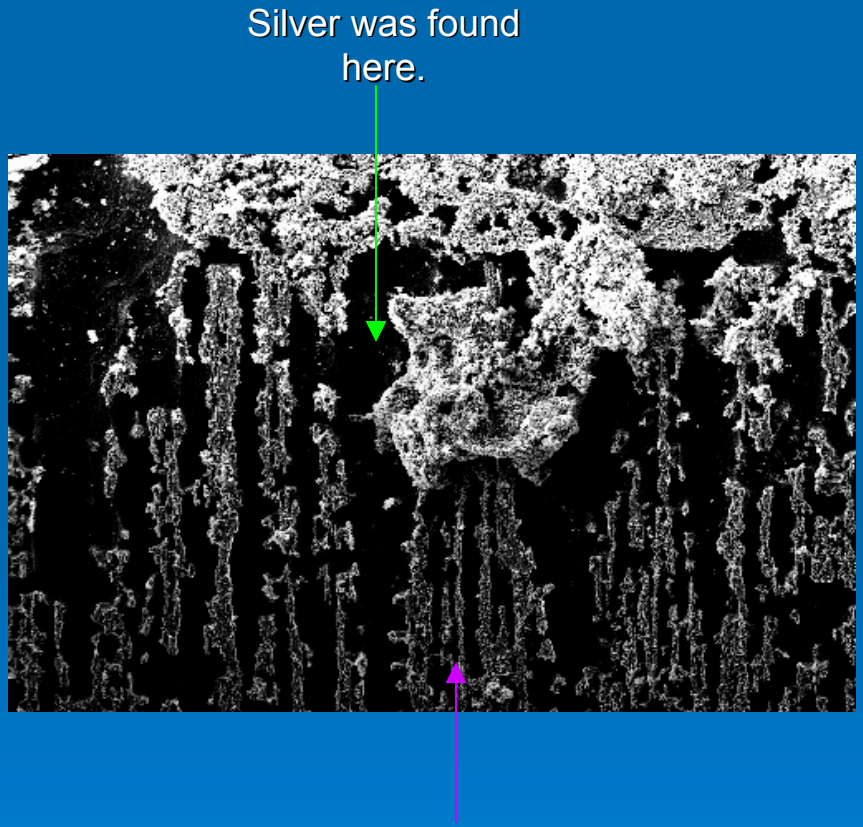
Undersea saltwater Plankton



Liverwort

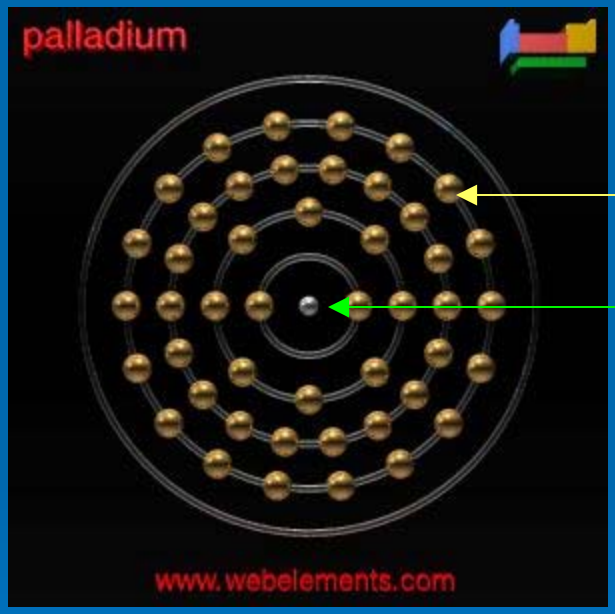


Transmutation



- Transmutation is the transformation of one element into another by one or a series of nuclear reactions. Biological transmutation has also been noted.
- Isotopic transmutation has also been noted -- i.e., it stays the same element, but has a different nuclear mass.

Transmutation in Palladium



electron

nucleus

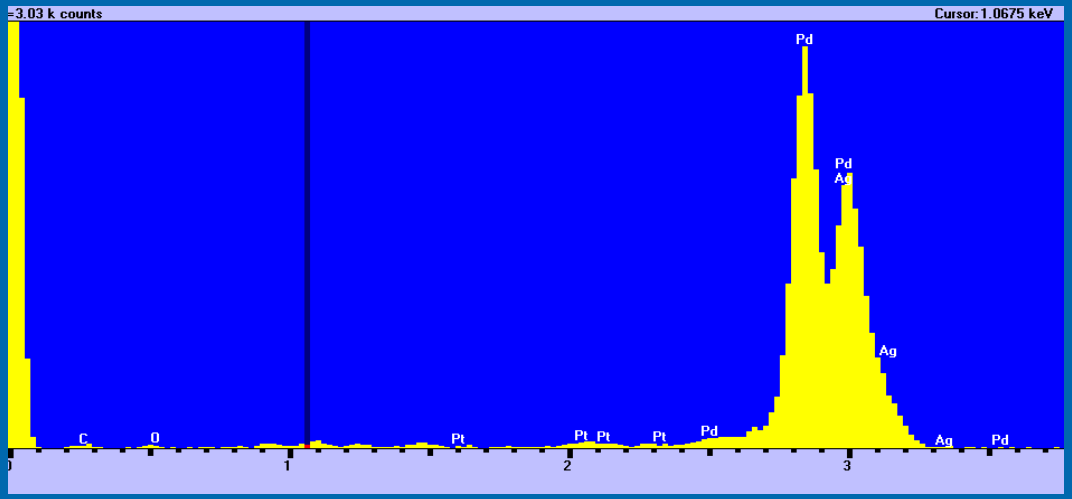
$^{108}Pd + n \rightarrow {}^{109}Pd,$

then

$^{109}Pd \rightarrow {}^{109}Ag + \beta$

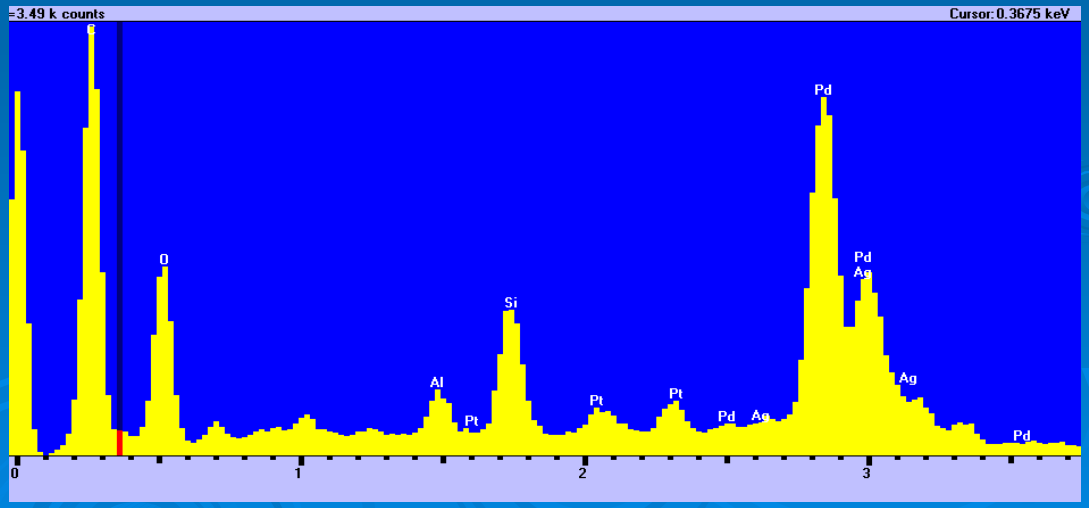
This is a palladium atom. Its electron structure is quite large and transmutation occurs when an electron leaves the nucleus (or a neutron becomes a proton).

X-Ray Analysis

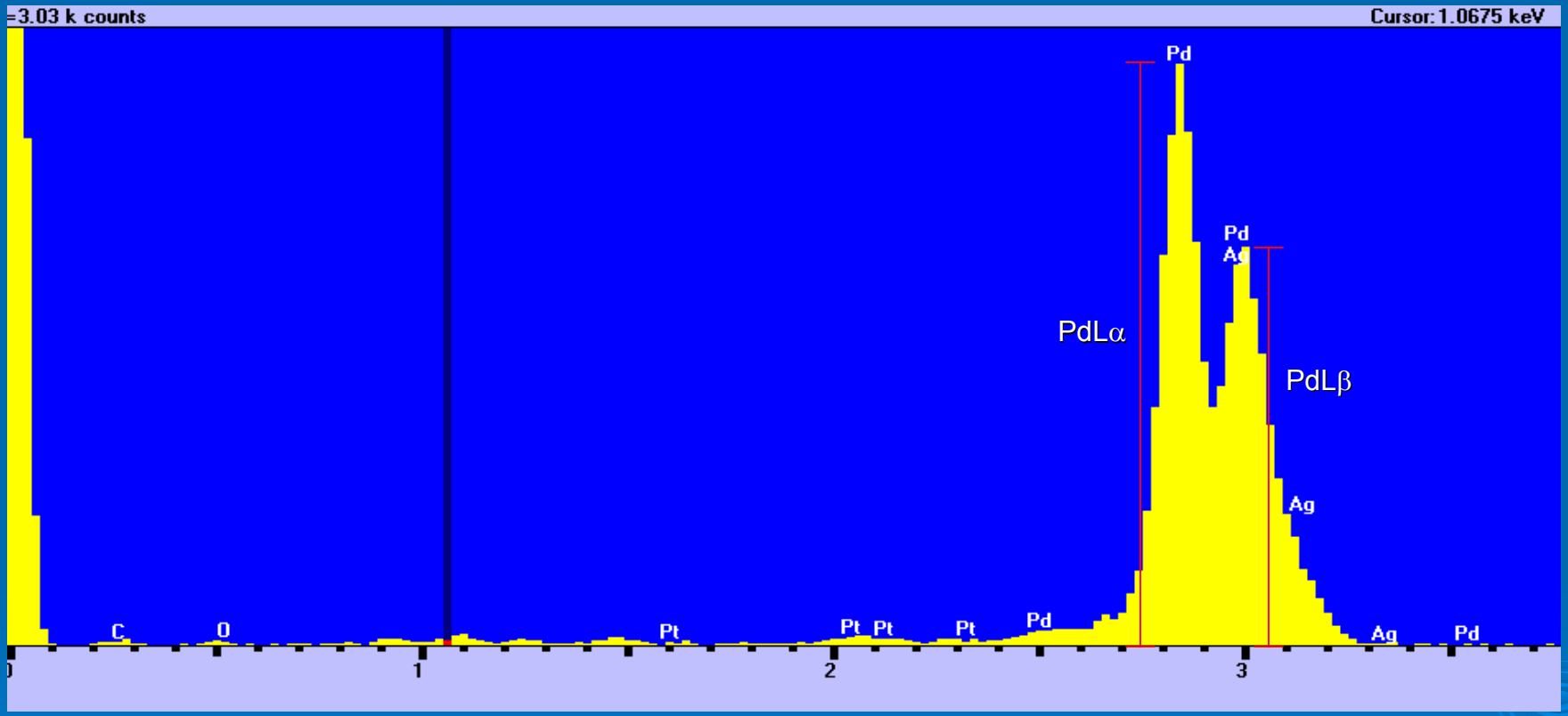


Program that locates and labels various elements and isotopes in a sample.

Top graph shows evidence of silver, whereas the bottom graph does not; it does show many other elements though.



Evidence of Transmutation



Presence of transmutated silver (Ag) is measured by a PdLβ/PdLα ratio.

Sample Calculation of PdLβ/PdLα ~

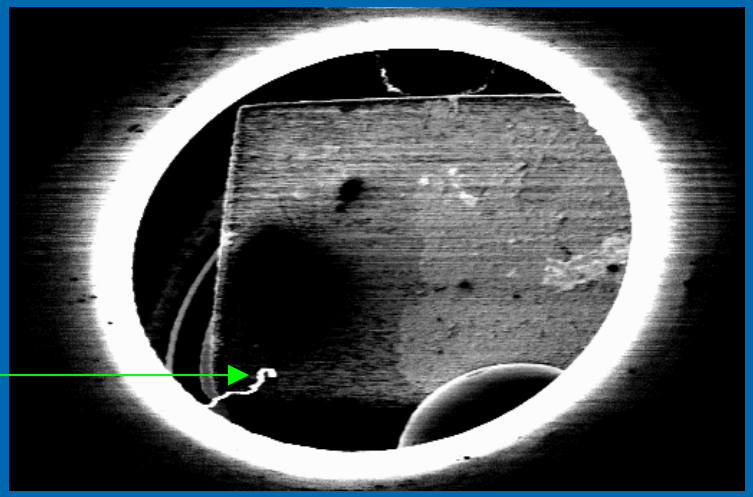
If PdLb is 3.8cm, and PdLa is 5.1cm,

3.8 / 4.7 = 74.5%

74.5% > 40.0% → YES!

AutoBeam

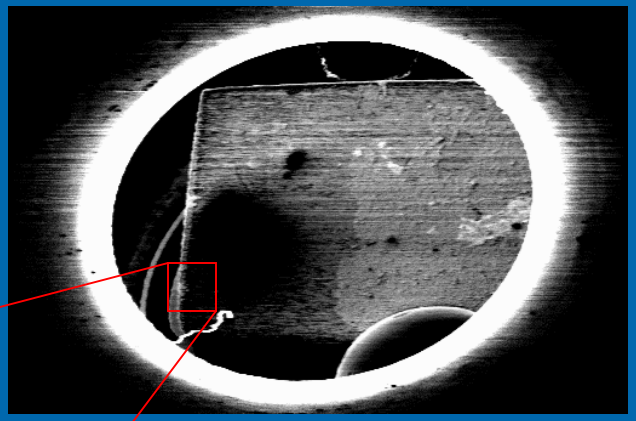
Non-metallic, non-conductive object. Collects electrons but can't release them so it becomes very bright.



- The SEM can take pictures at multiple magnifications, but sometimes it is necessary to just get one large overall shot of the metal from which you can then go off of.
- This is a Palladium cathode from a very similar experiment. We were unable to analyze ours because we ran out of time because we had run the experiment so long.

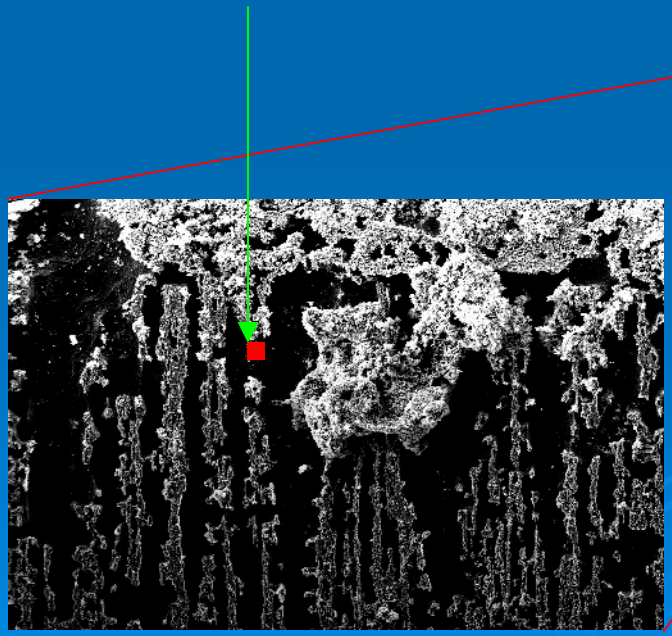
Magnification

This is an original image of one of the Palladium cathodes we analyzed. It has been imaged at three different magnifications and each time, the small red square is what we were looking at.



0.0x mag

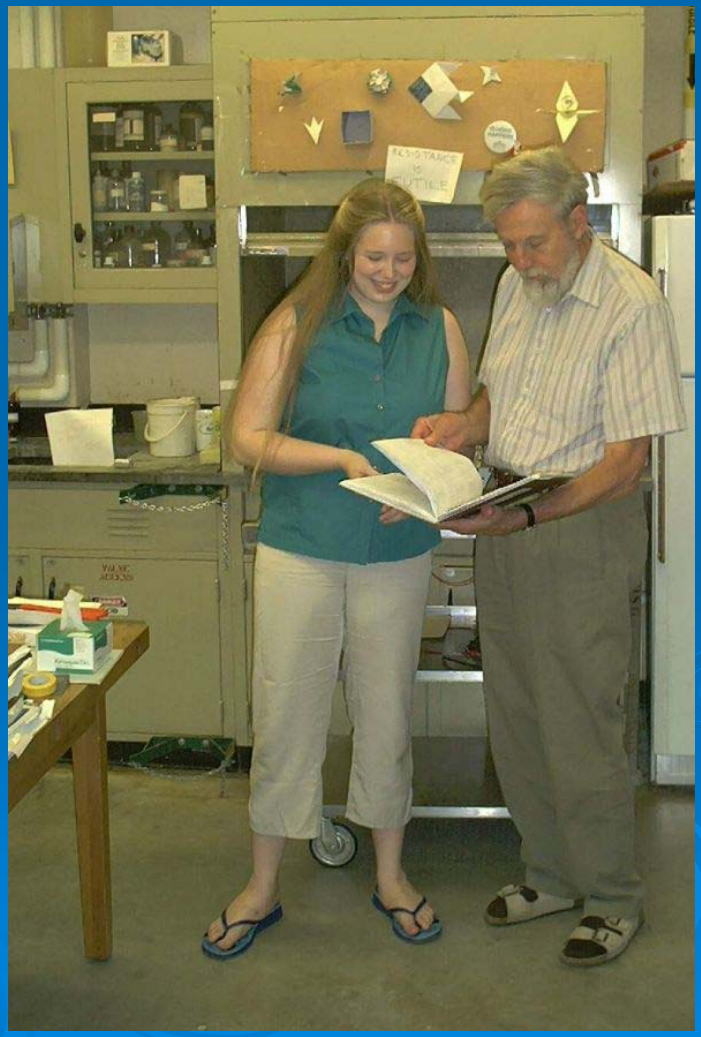
910x mag



1300x mag

Transmutation and Cold Fusion

While we are no closer to solving the mystery of cold fusion, transmutation will play a definite role in solving this puzzle.



What's to Come…

- We consistently had excess heat and we also discovered evidence of transmutation.
- Overall, we had a relatively successful experiment, and as the mystery of Cold Fusion slowly unravels, we hope to one day see just how our research has turned out.
- Thanks for everything Dr. Dash!

Acknowledgements

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- Portland State University
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Questions and Comments